

A Review of the North American Species of *Thinodytes* Graham and *Mauleus* Graham (Hymenoptera: Pteromalidae)

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Abstract.—The *Halticoptera*-group is defined as containing those pteromaline pteromalid genera with a reticulate body, acarinate pronotal collar, weakly developed notauli, weakly delimited frenum, propodeum with the median carina and plicae connected posteriorly by a W-shaped carina, petiole with a basal flange, and the hind margin of the first gastral tergite sinuous laterally and usually emarginate medially. Genera included in this group are *Halticoptera* Spinola, *Halticoptera* Erdős, *Andersena* Bouček, *Thinodytes* Graham, *Syntomopus* Walker, *Mauleus* Graham, and *Ploskana* Bouček. *Thinodytes* and *Mauleus* are revised for the Nearctic region and keys to the world's described species are given. New species include *T. caroticus* n. sp., *T. cyzicopsis* n. sp., *T. petiolatus* n. sp., *M. cultratus* n. sp., *M. iligneus* n. sp., and *M. venetus* n. sp. *Polycystus nigritus* Howard is transferred to *Mauleus* as *M. nigritus* n. comb. and *Gastrancistrus cephalon* Walker is transferred to *Thinodytes* as *T. cephalon* n. comb. *Bubekia fallax* Gahan n. syn. is synonymized with *T. cephalon* Walker.

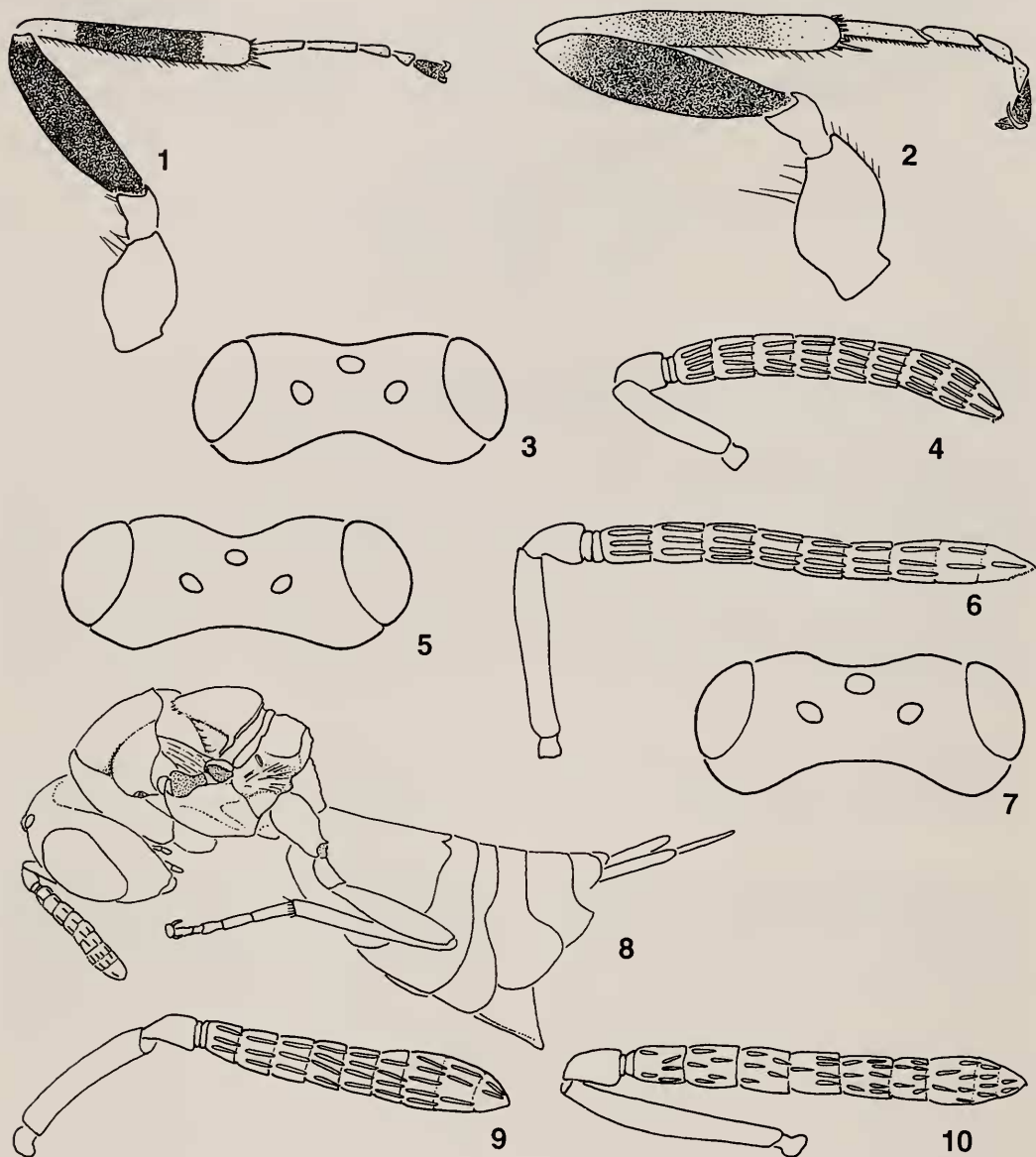
INTRODUCTION

The *Halticoptera*-group is herein defined as containing those pteromaline pteromalid genera with: body reticulately sculptured, pronotal collar acarinate (Figs 21, 22), notauli weakly developed (Figs 21, 22), frenum weakly delimited (Figs 21, 22), propodeum with a sharp median carina and the plicae connected posteriorly by a W-shaped carina (Figs 17-20), petiole braced basally by an anteriorly directed lateral and ventral flange (Figs 17-20), and hind margin of first gastral tergite sinuous laterally and usually emarginate medially (Figs 21, 22). Genera of this group include *Halticoptera* Spinola, *Halticoptera* Erdős, *Andersena* Bouček, *Thinodytes* Graham, *Syntomopus* Walker, *Ploskana* Bouček, and *Mauleus* Graham. Three other genera that show many of the characteristics of the *Halticoptera*-group and which probably are more or less closely related to the *Halticoptera*-group

are *Notoglyptus* Masi, *Sphegigaster* Spinola, and *Schimitschekia* Bouček.

Except for *Thinodytes* and *Mauleus*, the North American species of all the genera of the *Halticoptera*-group occurring in the Nearctic region were recently reviewed or are currently being studied. *Andersena* includes only one species (Bouček 1993). Anderson (1990) reviewed *Halticoptera* for North America and is currently revising *Halticoptera*. The world species of *Notoglyptus* and the Nearctic species of *Syntomopus* and *Sphegigaster* were reviewed by Heydon (1988), Heydon (1993), and Heydon and LaBerge (1988), respectively. This paper reviews the Holarctic species of *Thinodytes* and *Mauleus*. [*Ploskana* was reviewed by Bouček (1976).] Research by the author has revealed the presence of numerous species of both these genera in Central and South America.

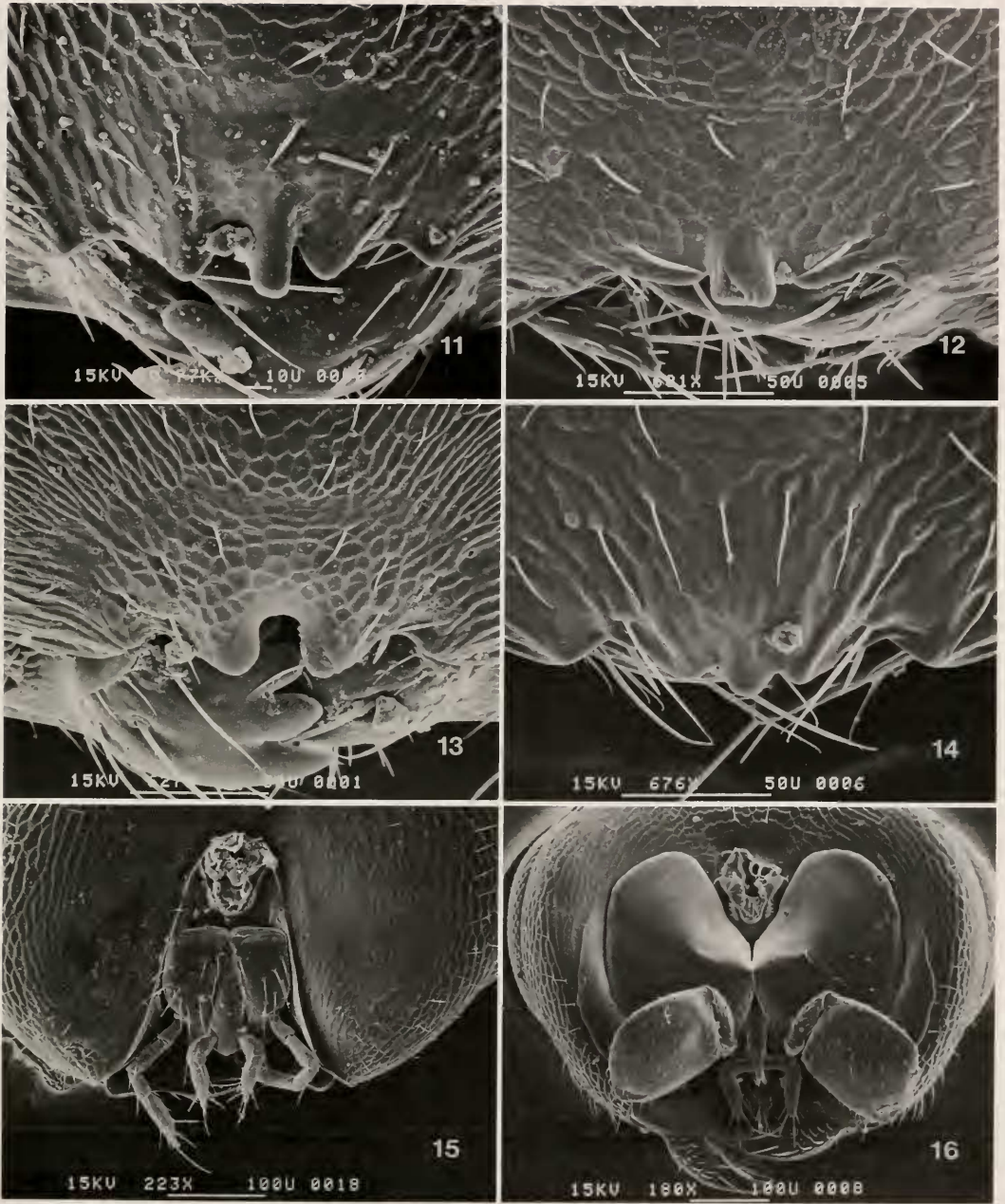
Thinodytes previously contained two described species, the Palearctic species *T. cyzicus* (Walker) 1839, and the Carib-



Figs. 1–10. 1, *Thinodytes caroticus* n. sp., female hind leg; 2, *Thinodytes cephalon* (Walker), 2, female hind leg; 3, 4, *Thinodytes cyzicopsis* n. sp., female head dorsal view, 4, male antenna; 5, 6, *Thinodytes petiolatus* n. sp., 5, female head dorsal view, 6, male antenna; 7, *Thinodytes cyzicus* n. sp., female head dorsal view; 8, *Mauleus cultratus* n. sp., female habitus; 9, *Mauleus iligneus* n. sp., female antenna; 10, *Mauleus venetus* n. sp., female antenna.

bean species *T. clypeatus* (Girault) 1918. To these I add the New World species *T. cephalon* (Walker) 1843, **n. comb.**, and describe four new Nearctic species—*T. caroticus* n. sp., *T. cyzicopsis* n. sp., *T. petiolatus* n. sp., and *T. santerna* n. sp. *Mauleus*

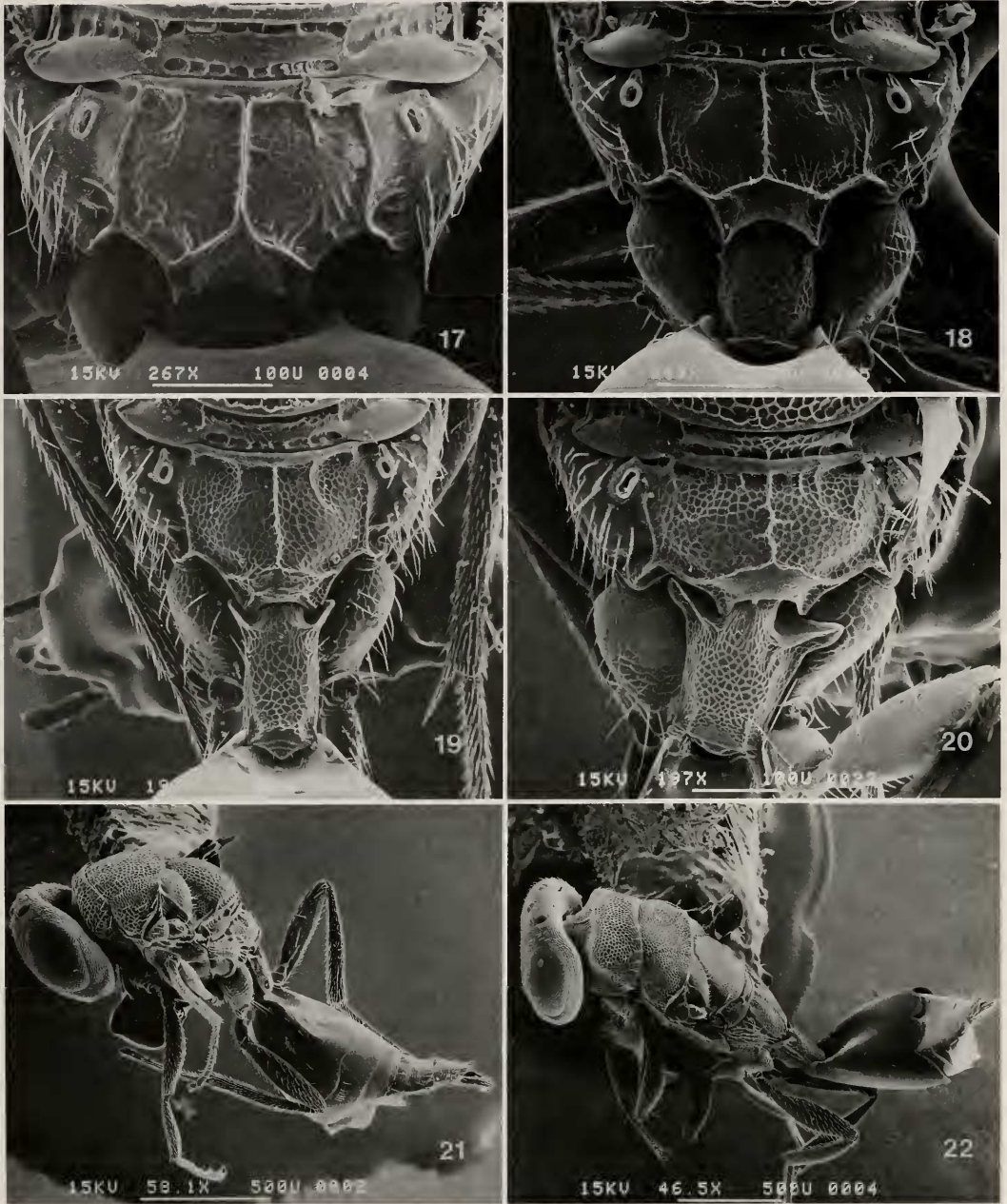
was created for the species *M. maderensis* Graham, 1981 from Madeira. However, this species is associated with plants native to Mexico and is suspected to be native to the New World (Bouček and Rasplus 1991). The New World origin of this



Figs. 11–16. 11, *Thinodytes petiolatus* n. sp., female clypeus; 12, *Thinodytes cephalon* (Walker), female clypeus; 13, *Mauleus iligneus* n. sp., male clypeus; 14, *Syntomopus americanus* Ashmead, female head dorsal view; 15, *Mauleus iligneus* n. sp., male head posterior aspect; 16, *Halticoptera* sp., male head posterior aspect.

species is given more credence by the presence of a described Neotropical *Mauleus* species, *M. nigratus* (Howard), 1897 n. comb. and the author's discovery of three

new Nearctic species—*M. cultratus* n. sp., *M. iligneus* n. sp., and *M. venetus* n. sp. These three new species are described herein.



Figs. 17–22. 17, *Thinodytes cephalon* (Walker), female propodeum and petiole; 18, *Thinodytes cyzicopsis* n. sp., male propodeum and petiole; 19, *Thinodytes petiolatus* n. sp., female propodeum and petiole; 20, 21, *Mauleus iligneus* n. sp., 20, male propodeum and petiole, 21, female habitus; 22, *Syntomopus arpedes* Heydon, female habitus.

METHODS

Terminology generally follows that of Graham (1969), except that genal concavity is used instead of genal hollow and

club is used instead of clava. In addition, the gastral tergites are numbered T1–T7 beginning with the first tergite after the petiole. The following abbreviations are used:

the median ocellar diameter is MOD, the ocellar-ocular distance is OOL, the posterior ocellar distance is POL, the lateral ocellar distance is LOL, the multiporous plate sensilla are MPP sensilla, the lower ocular line is LOcL, and the antennal funicular segments are F1 through F6. The measurements given in the descriptions can be converted to millimeters by multiplying by 0.02. The acronyms for the museums from which material was borrowed are listed in the acknowledgments section.

Thinodytes Graham

Dicyclus Thomson, 1876:221, 253. Type species: *Miscogaster cyzicus* Walker, 1839:200; by monotypy (examined). New name needed because of *Dicyclus* Walker, 1833:371, 455.

Thinodytes Graham, 1956:261. Type species: *Miscogaster cyzicus* Walker, 1839:200; by original designation (examined). Peck, Bouček, and Hoffer, 1964:41. Graham, 1969:150, 167. Hedqvist, 1975:167. Dzhanokmen, 1978:82. Bouček and Rasplus, 1991:32.

Description.—Body color varying from almost wholly black to metallic green; scape metallic or nonmetallic. Head and mesosoma mostly alveolate except sculpturing sometimes smooth on frenum (*T. cyzicopsis*, *T. petiolatus*, and *T. santerna*) and median panels of propodeum (*T. santerna*); petiole alveolate in species with quadrate to elongate petiole (Figs 18–20), smooth in species with transverse petiole (Fig. 17); gastral tergites nearly smooth. Clypeus variable, with either three asymmetrically arranged denticles (Fig. 11) (*T. cyzicopsis*, *T. cyzicus*, *T. petiolatus*), three symmetrically arranged denticles (*T. santerna* and *T. clypeatus*) or with single broad asymmetrically placed denticle (Fig. 12) (*T. cephalon* and *T. caroticus*). Head with short genal concavity often present; antennal torulus above LOcL. Antenna with formula 1:1:2:6:3; scape cylindrical, slender; length of flagellum plus pedicel of female less than head width (subequal in length in *T. cyzicopsis*), equal to or slightly greater than head width in male; funicular seg-

ments cylindrical; MPP sensilla usually in single row, their length about equal to length of funicular segment (Figs 4, 6); female club simple apically and with small patch of micropilosity on ventral side of terminal segment, except *T. cephalon* with terminal spine and large patch of micropilosity. Male maxilla with stipites unenlarged; palps slender (Fig. 15). Mesosoma arched dorsally; pronotum with collar very short medially, anterior edge rounded; mesoscutum with notaulus incomplete or extending to hind margin of mesoscutum as impressed line; scutellum as long as wide, lacking anterior median sulcus, with two or three pairs of lateral setae (except *T. santerna* with many pairs), frenum not set off by sulcus; dorsellum a short transverse ridge; propodeum with width of median panels about 1.6× their length (Figs 17–19), plicae and median carina distinct and connected posteriorly by W-shaped carina (Figs 17–19), basal fovea sometimes bordered mesally by short straight carina (Fig. 17) (*T. clypeatus*, *T. cyzicopsis*, and *T. cephalon*), or by long sinuous carina (Figs 18, 19) (*T. cyzicopsis*, *T. cyzicus*, and *T. petiolatus*); spiracles ovate. Fore wing with postmarginal vein about as long as marginal vein but postmarginal vein sometimes distinctly shorter (*T. caroticus* and *T. cephalon*); stigma small, but its height half the distance between stigma and anterior wing margin in *T. clypeatus*; costal cell with one complete and two or three partial distal setal rows; basal cell bare except sometimes a few setae distally (*T. clypeatus* and *T. cyzicus*); basal vein setose except in *T. cephalon*; speculum developed and open posteriorly. Petiole braced basally by lateral and ventral anteriorly directed lamellate flange (Figs 17–19); petiole variable, sometimes transverse, unsclerotized ventrally, and without lateral setae (Fig. 17) (*T. caroticus*, *T. cephalon*, and *T. santerna*), or quadrate to elongate and sclerotized ventrally (*T. clypeatus*, *T. cyzicopsis*, *T. cyzicus*, and *T. petiolatus*); lateral setae sometimes present

(Fig. 19) (*T. cyzicopsis* and *T. petiolatus*); weak median carina present in *T. clypeatus*. Gaster of female ovate, acuminate apically, 1.4–1.8× as long as wide; hypopygium extending $\frac{1}{2}$ to $\frac{2}{3}$ gastral length; hind margin of T1 sinuous laterally and emarginate or straight medially.

Discussion.—Giving a few characters to separate *Thinodytes* from the other genera of the *Halticoptera*-group, particularly *Halticoptera*, *Mauleus*, and *Syntomopus*, is impossible because *Thinodytes* is what is left when the more distinct genera of the *Halticoptera*-group are characterized. Apomorphic characters among related genera common to all *Thinodytes* species such as the reticulate body, weakly developed notauli, poorly delimited frenum, propodeum with sharp median carina and plicae connected posteriorly by W-shaped carina, petiole with a basal bracing consisting of an anteriorly directed lateral and ventral flange, and the hind margin of the first gastral tergite being sinuous laterally and usually emarginate medially are the same characters defining the *Halticoptera*-group itself. So presently, *Thinodytes* can only be defined negatively. There are many South American species, some described and some not, that fit within the present definition of *Thinodytes*. Once these are investigated, it may be possible to divide *Thinodytes* into monophyletic generic units.

Halticoptera is distinguished from *Thinodytes* by a number of apomorphic character states including a bidentate clypeus, the antennal torulus located at or below the LOCL, the scape usually nonmetallic, the male maxilla with lamellately expanded palps and usually with another lobe on the stipites, and a median longitudinal carina on the petiole. *Thinodytes* has the clypeus

with variable numbers and arrangements of clypeal denticles, but no known *Thinodytes* species has a bidentate clypeus. The antennal torulus in *Thinodytes* is located distinctly above the LOCL (except in *T. petiolatus*), and the scape usually has metallic coloration. The male maxilla of *Thinodytes* lacks any expansion of the palps or any lobes on the stipites. *Thinodytes clypeatus* is the only species of *Thinodytes* that has a median carina on the petiole. *Halticoptera* species are commonly bright metallic green; those of *Thinodytes* are usually dark.

Mauleus is distinguished from *Thinodytes* by the bidentate clypeus (Fig. 13), the dorsum of the mesosoma as high as the vertex (Figs 8, 21), the median panels of the propodeum short (2× as wide as long) (Fig. 20), and the lateral flanges of the petiole enlarged and thickened (Fig. 20). In *Thinodytes*, the clypeus has various numbers and arrangements of clypeal teeth, but is never bidentate, the dorsum of the mesosoma is distinctly lower than the vertex, the median panels of the propodeum are longer (Figs. 17–19), and the basal flanges of the petiole are lamellate (Figs. 17–19).

Syntomopus is distinguished from *Thinodytes* by having an elongate pronotum (length about $\frac{1}{3}$ its width) (Fig. 22), three broad symmetrically arranged clypeal denticles (Fig. 14), and usually a flattened mesosoma (Fig. 22). The pronotum of *Thinodytes* is much shorter, those *Thinodytes* species having symmetrically arranged denticles have them fingerlike rather than broad (Fig. 11), and the mesosoma is never so flattened as it usually is in *Syntomopus* species.

Biology.—The known hosts of *Thinodytes* species are all small Diptera living in plants as leaf or stem miners.

KEY TO HOLARCTIC SPECIES OF *THINODYTES* GRAHAM

1. Petiole transverse, smooth (Fig. 17) 2
- Petiole as long as wide or longer than wide, reticulate (Figs 18–20) 4
2. Scape and legs beyond coxae pale, nonmetallic. Frenum and median panels of propodeum smooth. Plicae rounded and smoothly convergent posteriorly *santerna* n. sp.

- Scape mostly or completely metallic. Legs beyond coxae with metallic coloration or dark bands on femora and tibiae. Frenum and median panels of propodeum weakly to strongly alveolate. Plicae with distinct angle between parallel basal part and convergent posterior part 3
- 3. Hind margin of T1 emarginate medially. Dark bands on tibiae with sharp borders (Fig. 1). Female club with apex simple *caroticus* n. sp.
- Hind margin of T1 entire medially. Dark bands on tibiae with diffuse borders (Fig. 2). Female club with terminal spine at apex *cephalon* (Walker)
- 4. Clypeal denticles symmetrically arranged. Petiole with weak median carina. Ovipositor exerted for length equal to that of T7 *clypeatus* (Girault)
- Clypeal denticles asymmetrically arranged, the median denticle displaced to the left (Fig. 11). Petiole without a median carina (Figs 18–19). Ovipositor sheaths hardly exerted 5
- 5. Costal cell with three rows of setae distally. Eye length <4× as long as the temple length (Fig. 5). Body more or less all dark *cyzicus* (Walker)
- Costal cell with two rows of setae distally. Eye length >4× as long as the temple (Figs 3, 7). Body dark with diffuse metallic patches on head and mesosoma 6
- 6. Male with terminal segment of funicle appearing as wide or wider than long (Fig. 4). Petiole usually less than 1.7× as long as wide (Fig. 18). Female with petiole usually less than 1.5× as long as wide. Both sexes with hind margins of T1 and T2 as long medially as laterally. (eastern United States and Canada) *cyzicopsis* n. sp.
- Males with terminal segment of funicle appearing longer than wide (Fig. 6). Petiole usually more than 1.7× as long as wide. Female with petiole usually more than 1.5× as long as wide (Fig. 19). Both sexes with hind margins of T1 and T2 usually longer laterally than medially. (far western United States and Canada) *petiolatus* n. sp.

Thinodytes caroticus Heydon, new species
(Fig. 1)

Holotype, female.—Color: Body dark blue–green except flagellum, fore tarsus, wing veins brown; pretarsi black; knees, apical 1/5 of tibiae, middle and hind tarsi white, border between the light ends and dark median band of tibiae sharp (Fig. 1).

Sculpture: Clypeus smooth; head and mesoscutum delicately and regularly alveolate; scutellum, frenum finely alveolate; median panels of propodeum obscurely alveolate.

Structure: Body length 1.2 mm. Head width 1.4× height (23:17), 2.3× length (23:10); anterior margin of clypeus with single broad tooth; malar distance 5× length of genal concavity; eye height 1.2× length (10:8); 2.0× malar distance (10:5), eye length 4.0× temple length (8:2); ratio of MOD, OOL, POL, LOL as 2.0:3.0:6.5:3.0; vertex rounding regularly into occiput; torulus 1/2 own diameter above LOCL. Antenna with length of pedicel plus flagel-

lum 0.87× head width (20:23); relative lengths of scape, pedicel, annelli, F1–6, club as 6.5:2.5:0.5:2.0:2.0:2.0:2.0:2.0:5.0; widths of F1, F6, club as 2:3:3; apical club segment simple apically, with micropilosity ventrally. Mesosoma arched dorsally, length 1.3× width (25:19); dorsellum short smooth band; propodeum with basal fovea part of continuous groove across anterior margin of median panels, with short weak longitudinal carina crossing groove halfway between plica and median carina, with spiracles on anterior margin of propodeum, with nucha lunate strip and carinate anteriorly. Fore wing with ratio of lengths of submarginal, marginal, postmarginal, stigmal veins as 19.0:11.5:9.0:5.0; stigma small; basal cell bare; basal vein with row of 4 setae. Petiole conical, transverse, smooth, with median carina. Gaster fusiform, length 1.8× width (30.0:16.5); hind margin of T1 emarginate medially; ovipositor sheaths hardly exerted; hypopygium extending 1/2 gastral length.

Allotype, male.—Color pattern similar to holotype except basic body color dark blue; fore tarsi pale brown; pale portions of legs pale yellow-brown instead of white. Body length 1.2 mm. Antenna with length of pedicel plus flagellum $0.98\times$ head width (21.0:21.5); relative lengths of scape, pedicel, annelli, F1-6, and club as 6.0:2.5:0.5:2.0:2.0:2.0:2.0:2.0:6.0; widths of F1, F6, club as 2.5:3.0:3.0; funicular setae sparse, reclinate. Gaster ovate, length $1.5\times$ width (23:15).

Variation.—The body length of females examined varied between 1.2 and 1.8 mm and males between 1.0 and 1.4 mm. The color of the dorsum of the mesosoma varies from dark blue-green to dark blue. The dark bands on the legs are always distinct, but the intensity of their metallic coloration is variable.

Discussion.—*Thinodytes caroticus* most closely resembles *T. cephalon* because both species are dark in color; have a single, broad, asymmetrically placed clypeal denticle; and have smooth, transverse petioles. *Thinodytes caroticus* differs from *T. cephalon* in the following: 1. The hind margin of T1 is emarginate in *T. caroticus*, but straight in *T. cephalon*. 2. The basal vein of the fore wing is setose in *T. caroticus*, but bare in *T. cephalon*. 3. The median panels of the propodeum are weakly sculptured in *T. caroticus*, but distinctly alveolate in *T. cephalon*. 4. The hypopygium extends about $\frac{1}{2}$ the length of the gaster in *T. caroticus*, but about $\frac{2}{3}$ the gastral length in *T. cephalon*. 5. The dark bands on the tibiae are distinct with sharp borders in *T. caroticus*, but are less distinct and have diffuse borders in *T. cephalon*. These distinctive tibial color bands are unique to *T. caroticus* and will identify the species at a glance (Fig. 1).

Etymology.—The species name comes from the Greek *karotikos*, meaning stupefying or soporific, and refers to the general nondescript appearance of this species.

Type Material.—The holotype, allotype (both UCDC) and one male paratype were

all reared by the author from the leaf mines of *Calycomyza promissa* (Frick) (Diptera: Agromyzidae) collected 30 June 1985 on the South Farms of the University of Illinois, near Champaign, Illinois. Fifty-nine additional paratypes seen were collected as follows (CNCI, INHS, SEMC, UCDC, USNM): Bermuda. DEVONSHIRE PARISH: Devonshire Marsh, 27.VI.1988, 1 male. PAGOT PARISH: Berry Hill Road, 29.VI.1988, 2 females, 3 males; Botanical Garden, 27.VI.1988, 1 female; Camdon Marsh, 29.VI.1988, 1 female. SMITHS PARISH: Spittal Pond, 27.VI.1988, 1 female. Canada. ONTARIO: Chatham, 1952 (mass reared from Hessian fly straw), 1 male. United States. CALIFORNIA: Hawthorne, IX.1940 (ex Aster blotch), 3 females, 1 male; Jepson Prairie Preserve (13 km s. Dixon), 20.V.1983, 1 female; Lake Hennessy (11 km ese. St. Helena), 28.X.1990, 1 female; Los Angeles County (bred from dipterous leaf miner), 1 female; Sacramento, 16.IX.1924 [ex *Agromyza pusilla* (prob.=*Liriomyza pusilla*)], 1 female; Soquel, 26.VIII.1948 (ex *Agromyza* sp.), 2 females, 1 male; 11 km e. St. Helena (Lake Hennessey), 28.X.1990 (on *Baccharis*), 1 female, 7.IX.1991 (on *Heracleum*), 1 male; 6 km e. Suisun City, 11.VIII.1990, 2 males; 1000 Palms, 29.III.1977, 1 female; Westwood Hills (Los Angeles County), 5.XI.1940 (ex serpentine leaf miner in Zinnia), 4 females, 1 male. FLORIDA: Bradenton, 27.XI.1946 [ex *Liriomyza pissilla* (prob.=*Liriomyza pusilla*)], 1 male; Jacksonville, 2 females. GEORGIA: Savannah, 5.VI.1943 (parasite of goldenrod leafminer), 3 females. ILLINOIS: South Farms of the University of Illinois, 19.V.1985, 1 female; White Heath, 24.IX.1939, 1 female. INDIANA: 4 miles s. New Harmony (Harmony State Park), 28.VI.1983, 2 females; 2 miles s. New Lisbon, 14.VII.1981, 1 male. IOWA: Sioux City (reared from leaf miner on sunflower leaf), 1 female, 5.VIII.1921 (reared from mine of leaf on sunflower), 1 female. KANSAS: Lawrence, 14.V.1955, 1 female. MINNESOTA: Albert Lea,

26.VII.1960, 1 female. NEW MEXICO: Cimarron, 1909, 1 female; Springer, 1909, 1 female, 3 males. TEXAS: Clarendon, 19.IX.1905 (on *Grindelia squarrosa* (Pursk) Dunal (Compositae), 1 female; Ennis, 27.IX.1905 [ex dipterous leaf miner of *Machaeranthera annua* (Rydb.) Shinner (Compositae)], 2 females; Roma, 26.III.1948 (ex pupa of dipterous leaf miner), 3 females, 3 males.

Biology.—This species has been reared from leaf-mining Agromyzidae, mostly on Compositae. Known hosts include *Calycomyza promissa* (Frick) and *Liriomyza pusilla* (Meigen). Because *L. pusilla* is a Palearctic agromyzid species (Spencer 1976) and is not known from the Nearctic region (Spencer and Steyskal 1986), it is likely that this host record is in error. There is one record from Chatham, Ontario from Hessian fly straw. *Thinodytes caroticus* was also reared from leaf miners on *Machaeranthera annua*, Zinnia, goldenrod, sunflower, and "Aster". It has been reared from both linear-mining and blotch-making leaf miners. Other plant associations of a more uncertain nature include the composites *Baccharis* sp., *Heracleum* sp., and *Grindelia squarrosa*.

Thinodytes clypeatus (Girault)

Polycystus clypeatus Girault, 1918:128. Holotype, female (USNM); Hym. Type No. 20682; (examined).

Thinodytes clypeatus (Girault): Heydon, 1989:193.

Redescription.—Holotype, female. Color: Mesosoma, petiole black, with blue tints on propodeum and pleural regions; gaster dark brown; legs with basal $\frac{2}{3}$ of femora brown, remainder of legs white.

Sculpture: Dorsum of mesosoma regularly and delicately reticulate; median panels of propodeum weakly alveolate; petiole alveolate.

Structure: Head with anterior margin of clypeus with three symmetrically arranged fingerlike denticles, torulus above LOCL. Antenna with lengths and widths

of segments as follows (in μm): scape 19.5 \times 3.6: pedicel 6.0 \times 4.5: annelli 2.6 \times 3.6: F1 5 \times 6: F2 4.6 \times 6.0: F3 5.2 \times 6.2: F4 4.6 \times 6.5: F5 4.6 \times 6.8: F6 missing; club 13.4 \times 6.8; club simple apically. Mesosoma with dorsum rather flat, length 1.4 \times width (33:24); pronotum with collar width 11 \times length (22: 2), sides converging posteriorly; notauli shallow posteriorly; scutellum with two pairs of lateral setae, frenum almost indistinguishable from remainder of scutellum; propodeum with length of median panels 0.45 \times width, with row of foveae separated by carinae along anterior margin, spiracle on anterior margin of propodeum, nucha a raised smooth crescent. Fore wing with relative lengths of submarginal, marginal, postmarginal, stigmal veins as 21:12:11:6; stigma large, height $\frac{1}{2}$ distance between stigma and anterior margin of wing; basal cell with one seta; basal vein with three setae. Petiole length 1.2 \times width (6:5); with weak median carina; lacking lateral setae. Gaster fusiform, length 1.7 \times width (31.0: 18.5); T1 emarginate medially; hypopygium extending $\frac{2}{3}$ length of gaster; ovipositor sheaths exerted for length equal to that of T7.

Discussion.—The holotype has the head removed and crushed on a slide. *Thinodytes clypeatus* differs from all other described *Thinodytes* species because it has an enlarged stigma, exerted ovipositor sheaths, and a median carina on the petiole. *Thinodytes clypeatus* has three symmetrically arranged denticles like *Syntomopus* species, but *T. clypeatus* differs from *Syntomopus* species in several ways. The denticles of *T. clypeatus* are fingerlike lobes like those of the other *Thinodytes* species with three denticles, whereas the denticles of *Syntomopus* species are rather broadly triangular (Fig. 14). The pronotal collar of *Thinodytes clypeatus* is short, eleven times as wide as long; the pronotal collar in *Syntomopus* is only about three times as wide as long (Fig. 22). Most species of *Halticoptera* have a median carina on the petiole, but there are no other characters to indi-

cate a particularly close relationship between *T. clypeatus* and *Halticoptera*.

Distribution and Biology.—The type specimen was reared from a leaf miner on corn on 2 May 1916, on St. Vincent, British West Indies by F. Watts. De Santis (1979) reports this species from Barbados also, and gives the name of its host as *Agromyza parvicornis* Loew (Diptera: Agromyzidae).

Thinodytes cephalon (Walker),
new combination

Figs 1, 17

?*Pteromalus Rhæo* Walker, Walker 1839b:88–89.

Lectotype, female (BMNH); Hym. Type No. 5.772 (examined).

Gastrancistrus cephalon Walker 1843:30. Lectotype, male (BMNH); Hym. Type No. 5.661 (examined).

Bubekia fallax Gahan, 1933:114–116. Holotype, female (USNM); Type No. 44841 (examined). Allen and Painter, 1937:225. Nikol'skaya, 1937:25. Peck, 1951:538. Thompson, 1958:587. Peck, 1963:610–611. Morrill and Kieckhefer, 1971:1130. Allen and Pienkowski, 1973:616, 617. Burks, 1979:789. Hendrickson, 1979:300, 302. n. syn.

Discussion.—*Thinodytes cephalon* is easily distinguished by its single broad clypeal denticle, apical spine on the female club, notauli traceable to the hind margin of the mesoscutum as impressed lines, bare dorsal vein, smooth and short petiole (Fig. 17), and first gastral tergite having the hind margin entire.

A possible senior synonym of *T. cephalon* is *Pteromalus rhæo* described from Chiloe Island, Chile. The lectotype female (designated herein) of *P. rhæo* is unfortunately missing the head. It appears similar to specimens of *T. cephalon* examined, of which many specimens in my collection and the CNC collection were from Chiloe Island, but it is significantly larger than any other specimen examined. The median panels of the propodeum in *P. rhæo* are entirely rugose and the plicae are posteriorly divergent. In other *T. cephalon* examined, the median panels have few ru-

gae which are located mostly posteriorly, and the plicae are parallel. The hind tibia in *P. rhæo* is almost uniform in color; in *T. cephalon*, the hind tibia are distinctly dark over the middle half or more. *Pteromalus rhæo* may be within the range of variation of what is recognized as *T. cephalon*, but I am reluctant to formally synonymize the name until more is known about the range of variation of *T. cephalon* in South America.

Distribution.—*Thinodytes cephalon* is one of the most commonly collected New World pteromalids. Its distribution extends throughout most of North and South America (from Chile to Canada and also Bermuda).

Biology.—*Thinodytes cephalon* is a parasitoid of dipterous larvae that mine leaves or grass stems. *Thinodytes cephalon* was originally described from puparia of the Hessian fly, *Phytophaga destructor* (Say) (Diptera: Cecidomyiidae) (Gahan 1933). It has also been reared from the wheat stem maggot, *Meromyza americana* Fitch (Diptera: Chloropidae), in a number of studies (Gahan 1933; Allen and Painter 1937; and Morrill and Kieckhefer 1971). Allan and Painter report that *T. cephalon* probably oviposits into the larval stage of this host. One additional host added herein is *Liriomyza trifoliarum* Spencer (Diptera: Agromyzidae) on alfalfa.

Thinodytes cyzicopsis Heydon,

new species

Figs. 3, 4, 18

Holotype, female.—Color: Head, mesosoma black with metallic green patches as follows: entire dorsellum, pairs of spots alongside median ocellus, lateral hind corners of pronotum and upper epimeron; metallic blue patches as follows: on inner orbits, anterior part of lateral lobe of scutum and propodeum. Antenna with scape, pedicel dark blue; flagellum black. Petiole black. Gaster brownish black with metallic blue reflections dorsally, green ventrally. Legs with coxae black with weak blue re-

flections; trochanters, femora brownish black with weak green reflections, knees yellow, tibiae with diffuse-edged dark brown band extending $\frac{2}{3}$ their length; fore tarsi brown; middle and hind tarsi with pretarsi black, remainder yellow.

Sculpture: Head, mesosoma, regularly and delicately alveolate; frenum, propodeum shallowly and indistinctly alveolate; petiole finely alveolate.

Structure: Body length 1.6 mm. Head width $1.2 \times$ height (27:22), $2.2 \times$ length (27:12); anterior margin of clypeus with three minute asymmetrically arranged apical denticles; genal concavity absent; eye height $1.4 \times$ length (13:9), $1.9 \times$ malar distance (13:7), length $4.5 \times$ temple length (9:2) (Fig. 3); ratio of MOD, OOL, POL, LOL as 2.5:4.0:7.0:3.0; vertex rounding smoothly into occiput; torulus $\frac{1}{2}$ own diameter above LOCL. Antenna with length of pedicel plus flagellum $1.0 \times$ head width (27:27); relative lengths of scape, pedicel, anelli, F1–6, club as 11.0:3.0:1.0:2.5:3.0:2.75:2.75:2.5:2.5:7.0; widths of F1, F6, club as 3.0:3.5:3.5, F1–4 appearing quadrate, F5–6 slightly transverse; club simple apically, with minute patch of micropilosity on terminal segment. Mesosoma arched dorsally, length $1.6 \times$ width (36:22); pronotum with humeral angles squared; mesoscutum with notauli shallow; dorsellum bandlike, short, weakly alveolate; propodeum with basal fovea bordered mesally by sinuous carina; nucha a raised band, weakly carinate anteriorly; spiracle $< 0.5 \times$ own diameter from anterior margin of propodeum. Fore wing with ratio of lengths of submarginal, marginal, postmarginal, stigmal veins as 25:13:14:8; stigma small, maximum width only slightly more than stigmal vein width; basal cell bare; basal vein setose. Petiole length $1.2 \times$ width (6:5); without median carina; with one pair of lateral setae. Gaster length $1.4 \times$ width (31:22); hypopygium extending to about $\frac{2}{3}$ length of gaster; ovipositor sheaths hardly exerted.

Allotype, male.—Color similar to holo-

type except frons blue, mesoscutum with a pair of large diffuse green spots; axilla green. Body length 1.3 mm. Antenna (Fig. 4) with length of pedicel plus flagellum $1.0 \times$ head width (24:23); relative lengths of scape, pedicel, anelli, F1–6, club as 7.0:3.0:1.0:2.0:2.5:2.5:2.5:2.5:2:6.5; widths of F1, F6, club as 2.0:2.5:2.5; setae fine, reclinate. Petiole length $1.2 \times$ width (5:4) (Fig. 18). Gaster ovate, length $1.2 \times$ width (20.0:16.5).

Variation.—The body color varies from mostly dark, like the holotype, to the pattern shown by the allotype male. The intensity, size, number, and hue of the metallic spots on the body are highly variable. The color of the metallic patches varies from coppery green to green to blue-green. The body length ranges between 1.4 and 1.8 mm in females and 1.2 and 1.7 mm in males. The length of the marginal vein varies from 0.9 to 1.2 times the length of the postmarginal vein but averages about equal its length [$x = 1.02 \pm (S.E.)0.02$ ($n = 12$)]. The petiole averages 1.39 ± 0.045 ($n = 7$, range 1.2–1.5) times as long as wide in the females and 1.57 ± 0.061 ($n = 7$, range 1.2–1.9) times in males (Fig. 18). The pair of lateral setae on the petiole are sometimes difficult to see because they tend to lie near the anterior flanges of the petiole.

Discussion.—*Thinodytes cyzicopsis* resembles the Palearctic species *T. cyzicus* (Thomson), but differs from that species in the following: 1. *Thinodytes cyzicopsis* has a series of metallic patches on the body, which are lacking in *T. cyzicus*. 2. The ratio of the eye length to temple length averages 4.25 ± 0.12 ($n = 6$, range 3.8–4.5) in female *T. cyzicopsis* (Fig. 3) but measured only 2.3 and 3.6 in two female *T. cyzicus* specimens examined (Fig. 5). 3. The costal cell of the fore wing of *T. cyzicopsis* has two rows of setae distally, whereas there are three rows distally in the costal cell of *T. cyzicus*. 4. The petiole has a pair of lateral setae in *T. cyzicopsis*, which are lacking from *T. cyzicus*.

Thinodytes cyzicopsis and *T. petiolatus* are very similar species and specimens cannot always be confidently separated. These two species are distinct from other *Thinodytes* in their common possession of a similar pattern of metallic patches on the head and mesosoma. Individuals of *T. cyzicopsis* differ from those of *T. petiolatus* in the following: 1. The ratio of eye height to malar distance in *T. cyzicopsis* averages 1.74 ± 0.035 ($n=8$, range 1.5–1.8) in females and 2.04 ± 0.032 ($n=9$, range 1.9 to 2.0) in males; in *T. petiolatus* the ratio is 1.48 ± 0.23 ($n=10$, range 1.4 to 1.6) in females and 1.77 ± 0.038 ($n=10$, range 1.6 to 2.0) in males. 2. All funicular segments of the male antenna are transverse to quadrate in *T. cyzicopsis*; all funicular segments are usually longer than wide in male *T. petiolatus*. 3. The ratio of petiole length to width in *T. cyzicopsis* averages 1.39 ± 0.045 ($n=7$, range 1.2 to 1.5) in females and 1.57 ± 0.061 ($n=7$, range 1.2 to 1.9) in males; in *T. petiolatus* it averages 1.93 ± 0.062 ($n=10$, range 1.5 to 2.0) in females (Fig. 19) and 1.95 ± 0.071 ($n=10$, range 1.6 to 2.4) in males. 4. The first gastral tergite in *T. cyzicopsis* is about as long medially as laterally, whereas T1 is often shorter medially than laterally in *T. petiolatus*. 5. The hind margin of T2 is straight to just noticeably concave in *T. cyzicopsis*, whereas it is usually distinctly concave in *T. petiolatus*. 6. The terminal segment of the male funicle appears quadrate to slightly transverse in *T. cyzicopsis*, whereas it appears elongate in *T. petiolatus*. In addition to these structural characters, *T. cyzicopsis* is found east of the Rocky Mountains, and *T. petiolatus* occurs from the Rockies west.

Type Material.—The holotype (CNCI) is from Kouchibouquac National Park, New Brunswick, and was collected 9 August 1977 by S. J. Miller. The allotype (USNM) is from Ithaca, New York, and was collected on vernal alfalfa on 22 June 1968 by A. G. Wheeler. Sixteen paratypes were collected as follows (CNCI, UCDC, USNM):

Canada. ALBERTA: Elkwater Lake, 21.VII.1956, 1 female; Lethbridge, 1 female. NEW BRUNSWICK: Kouchibouquac National Park, 20.IX.1977, 1 female. NOVA SCOTIA: Alton, IX.1964 [ex *Phytobia* (*Calycomyza*) *solidaginis* on *Solidago*], 1 male; Crosby, 31.VII.1952 (on apple), 1 male. ONTARIO: Ottawa, 22.VI.1972 (swept from *Salix blanda*), 1 male, 29.VI.1972 (swept from *Salix blanda*), 3 males, 24.VII.1972 (swept from *Salix blanda*), 1 male. QUEBEC: Lac Brule, 21.VII.1947, 1 female, 25.VII.1947 (swept from *Rosa rugosa*), 1 female, 9.VIII.1945, 1 female. United States. ILLINOIS: 2 miles e. Shumway, 7.VII.1980, 1 female; South Farms of the University of Illinois, nr. Champaign, 23.VI.1981, 1 male. MASSACHUSETTS: Hopkinton, 9.VIII.1951 (ex *Ilex* leaf miner), 1 female. NEW MEXICO: Mesilla, 4.V.1909, 1 female. WEST VIRGINIA: Winchester, 16.VI.1964, 1 male, 17.VI.1964, 1 male.

Etymology.—The species name is derived from the species name of *Thinodytes cyzicus* and the Greek suffix *-opsis*, meaning like or similar in appearance, and refers to the morphological similarity between *T. cyzicopsis* and *T. cyzicus*.

Biology.—Known hosts of *T. cyzicopsis* include *Phytobia* (*Calycomyza*) *solidaginis* (Agromyzidae)[on *Solidago* sp. (Compositae)] and an *Ilex* leafminer. The species has also been taken on *Salix blanda* (Salicaceae), *Rosa rugosa* (Rosaceae), and alfalfa. *Salix* and *Rosa* are probably primarily nectar sources because neither has many leaf-mining agromyzids, but these plants are important sources of nectar and/or honeydew for many parasitic Hymenoptera.

Thinodytes cyzicus (Walker)

Miscogaster cyzicus Walker, 1839a:200. Lectotype, female (BMNH); Hym. Type No. 5.2570 (examined).

Syntomopus cyzicus (Walker): Walker, 1846:28. Schmiedeknecht, 1909:376.

Dicyclus circulus Thomson, 1876:253. Lectotype, female (LUND), not seen.

Thinodytes cyzicus (Walker): Graham, 1956:261. Graham, 1969:167. Askew, 1970:380. Hedqvist, 1975:180. Bouček, 1977:56. Kamijo, 1978:457. Takada and Kamijo, 1979:21, 22, 23, 25. Hedqvist, 1983:167. Bouček and Rasplus, 1991:32.

Discussion.—The synonymy of *Dicyclus circulus* with *Thinodytes cyzicus* is accepted on the authority of Graham (1969). *Thinodytes cyzicus* resembles *T. cyzicopsis* and *T. petiolatus*, because all three species have three small, sharp, asymmetrically arranged clypeal denticles (Fig. 11) and a long, reticulate petiole. Besides the geographic separation of their ranges, *T. cyzicus* can be distinguished from the two Nearctic species by its body color. *Thinodytes cyzicus* is uniformly dark and lacks the distinctive diffuse metallic patches on the head and mesosoma present in *T. cyzicopsis* and *T. petiolatus*. *Thinodytes cyzicus* also has three rows of setae distally in the costal cell, whereas *T. cyzicopsis* and *T. petiolatus* have only two rows. The eye length in *T. cyzicus* is 4× or less the length of the temple (Fig. 5), whereas *T. cyzicopsis* and *T. petiolatus* have the eye length more than 4× the length of the temple (Figs 3, 7).

Distribution.—*Thinodytes cyzicus* occurs throughout the Palearctic region, from Britain to Japan (Graham 1969; Bouček 1970; Kamijo 1978).

Biology.—The hosts of *T. cyzicus* are all Agromyzidae. Askew (1970) recorded this species from an agromyzid, probably *Phytomyza atricornis* Meigen, on *Senecio jacobaea* Linnaeus. Kamijo (1978) recorded *T. cyzicus* from *Chromatomyia horticola* (Goureau) (Diptera: Agromyzidae) on pea and from an agromyzid on *Lathyrus maritimus*. Takada and Kamijo (1979) recorded *T. cyzicus* as emerging from the puparium of *Chromatomyia horticola* and speculated that *T. cyzicus* may parasitize the larval stage of its host.

Thinodytes petiolatus Heydon,
new species
Figs 6, 7, 11, 19

Holotype, female.—Color: Body black but frenum, metanotum coppery; frons, vertex, gena, lateral region of pronotum, lateral lobe of mesoscutum, middle lobe of mesoscutum with pair of large diffuse metallic patches, anterior lateral corner of axilla dark metallic green; gaster with greenish reflections. Antenna with scape dark green; remainder brown, pedicel with weak green reflections. Legs with coxae black with greenish reflections; femora brown with greenish reflections; remainder of legs mostly yellow-brown, tibiae with broad diffuse brown band mesally, apical two tarsi brown. Wing veins pale reddish brown.

Sculpture: Clypeus weakly alveolate; face alveolate, cells elongate in radiating fashion from clypeus; remainder of head alveolate; mesoscutum, scutellum delicately and regularly alveolate except frenum smooth; median panels of propodeum alveolate; petiole finely alveolate.

Structure: Body length 1.8 mm. Head width 1.4× height (28:21), 2.6× length (28.5:11.0); clypeus with three small asymmetrically arranged clypeal denticles (Fig. 11); weak genal concavity extending ½ malar distance; eye height 1.3× length (12.0:9.5), 1.5× malar distance (12:8), length 4.8× temple length (9.5:2.0) (Fig. 7); ratio of MOD, OOL, POL, LOL as 2:4:7:3; vertex rounding regularly into occiput; antennal torulus just above LOcL. Antenna with length of pedicel plus flagellum 0.91× head width (26:28.5); ratio of lengths of scape, pedicel, anelli, F1–6, club as 11.5:3.5:1.0:2.5:2.5:2.5:2.5:2.5:6.0; widths of F1, F6, club as 2:3:3; club simple apically, with small patch of micropilosity ventrally on apical segment. Mesosoma arched dorsally, length 1.7× width (37:22); notauli shallow posteriorly; propodeum (Fig. 19) with basal fovea margined mesally by long sinuous carina; nucha a weakly

sculptured band, carinate anteriorly; spiracle $<0.5\times$ own diameter from anterior margin of propodeum. Fore wing with relative lengths of submarginal, marginal, postmarginal, stigmal veins as 27.0:14.5:15.0:9.0; stigma small; basal vein with row of setae along length. Petiole (Fig. 19) length $2.0\times$ width (8:4); without median carina; with two pairs of lateral setae. Gaster ovate-acuminate, length $1.4\times$ width (33:24); hind margin of T1 strongly sinuous laterally, emarginate mesally; ovipositor sheaths hardly exerted; hypopygium extending $\frac{2}{3}$ gastral length.

Allotype, male.—Body color similar to holotype except metallic spots more diffuse and extensive; frenum, metanotum blue-green; dark bands on tibiae very weak. Body length 1.3 mm. Antenna (Fig. 6) with length of pedicel plus flagellum $1.1\times$ head width (28:25); ratio of lengths of scape, pedicel, anelli, F1–6, club as 9.0:3.5:1.0:2.5:3.0:3.0:3.0:3.0:8.0; widths of F1, F6, club as 2:2:3; setae of flagellomeres fine, reclinate. Petiole length $2.0\times$ width (8:4). Gaster length $1.2\times$ width (20:16); truncate apically.

Variation.—The body color varies from like that of the holotype to very dark, with the green areas on the head and the mesosoma reduced and obscure, the frenum and metanotum green, and the tibiae dark metallic green. The body length of females examined varied between 1.3 and 1.8 mm and males varied between 1.0 and 1.6 mm. The sinuous carina on the propodeum sometimes extends only $\frac{1}{4}$ the length of the propodeum. The row of setae on the basal vein sometimes curls proximally, running a short distance along the cubital vein.

Discussion.—*Thinodytes petiolatus* and *T. cyzicopsis* are very similar species and are distinct from other *Thinodytes* species in the similar pattern of metallic patches on an otherwise dark body. Individuals of *T. petiolatus* and *T. cyzicopsis*, especially females, cannot always be distinguished with absolute certainty. Characters to sep-

arate these two species are given in the discussion section for *T. cyzicopsis*. The hind margin of T2 in many specimens of *T. petiolatus* is distinctly concave, but the visibility of this character depends on how the specimen has dried. This character is more distinct in the males than in the females.

Type Material.—The holotype (USNM) was collected at Roseworth, Idaho, on 19 June 1931, on *Salsola pestifer* by D. E. Fox and the allotype (USNM) was collected at Twin Falls, Idaho, on 5 August 1920 by R. H. Smith. Sixty paratypes were collected as follows (CNCI, INHS, UCDC, USNM): Canada. ALBERTA: Banff (Sunshine Lodge, 7500'), 24.VII.1962, 1 female; Elkwater, 9.VI.1956, 1 male; Elkwater Lake, 21.VII.1956, 1 male; Lethbridge, 7.VI.1956 (swept from barley), 1 female, 5.VIII.1956 (swept from barley), 1 male; nr. Lethbridge, 1924.1925, 1 female. BRITISH COLUMBIA: Bowser, 28.V.1955, 1 female; McQueen Lake, 10 miles n. Kamloops, 18.VI.1973, 1 male. United States. ARIZONA: Mesa, 3.VI.1958 (swept from alfalfa), 1 male. CALIFORNIA: Albany, 29.IV.1958, 1 male; Alpine Lake, VI.1971, 1 female; Apple Valley, 8.V.1955, 2 males; 15 miles w. Baker, 6.V.1977, 2 females, 1 male; Boca, 22.VII.1970, 1 female; Bolinas, 5.X.1975, 2 males; Camino, 21.VII.1948 (ex *Phytomyza aquilegiana*), 10 females; Cerro Noroeste (sw. corner of Kern Co.), 15.VII.1965, 1 female, Cuyler Harbor (San Miguel Island), 11.VII.1970, 1 male; Darwin Falls (nr. Panamint Springs), 29.III.1984 (on *Encelia*), 1 male; Emeryville, 28.V.1958, 1 male; Eureka Dunes (Inyo Co.), 15.V.1979, 1 male; Lake Tenaya, 23.VII.1949 (host *Recurraria milleri*), 1 female; Lake Tahoe, 29.VI.1927, 1 female; Lily Pond (alpine lake), VI.1971, 1 female; Los Angeles (*Agromyza playptera* Thom.), 1 female; Los Angeles Co., 1 male; McClure Beach (Marin Co.), 18.VII.1970, 1 male; Mt. Ingalls (Placer Co.), 11.VII.1964, 1 male; near Nicasio, 15.II.1991 (sweeping *Salix*), 2 males; 22 miles w. Panamint Springs,

7.V.1961, 2 males; Placer Co., VIII, 1 male; Sagehen Creek (near Hobart Mills), 24.VI.1970, 1 female, 21–25.VI.1982 (sweeping *Prunus*), 1 male, 12.VII.1972, 1 male, 11–15.VII.1982, 1 female, 23.VII.1968, 1 female, 1.VIII.1970, 1 female; San Bernardino Co., San Gorgonio Wilderness, 19.VII.1982, 1 male; Santa Cruz, 22.VIII.1948 (ex *Phytomyza* sp. B), 1 female; Santa Rosa, 25.V.1990, 2 males; Sheppard Pass Trail (Inyo Co.), 16.VII.1985 (on *Sphenosciadium capitellatum*), 1 male; Shively, 19.VI.1959, 1 female; Sonora Pass (Mono Co., 9624'), 20.VIII.1960, 1 female; Soquel, 26.VIII.1960 (ex *Agromyza* sp.), 2 females; Titus Canyon (Death Valley National Monument), 24.III.1984 (on *Cownia mexicana*), 1 male; Tomales Bay State Park (Marin Co.), 14.IV.1961, 1 male; Trinidad, 24.IX.1977, 1 female; Truckee, 20.VII.1970, 1 female; White Water, Snow Creek (1500'), 29.III.1955, 1 male; 6 miles w. Bassetts (Yuba Pass), 9.VII.1970, 2 females, 2 males. COLORADO: Chambers Lake (Larimer Co.), 16.VIII.1966, 1 male; 16 km n. Colorado Springs, 25.VII.1991, 1 male; Ft. Collins, 20.VIII.1895 (on boxelder foliage), 1 female, 1 male; Glacier Basin, Rocky Mountain National Park, 24.VII.1977, 1 male; Echo Lake (Mt. Evans, 10,500'), 4.VIII.1961, 1 female. IDAHO: Boise, 28.V.1984 (Malaise trap), 2 males; Buhl, 27.V.1929 (1 & 5¹), 2 males; Burley, 14.VI.1930 (3), 1 female, 9.VII.1931, 1 female; Eden, 11.VIII.1930 (2), 1 female; Hobbs Butte, 22.V.1931, 1 male, 6.VI.1931, 1 male; Hollister, 16.V.1931 (3), 1 male, 20.V.1931, 2 males, 2.VI.1931, 1 female, 1 male, 5.VI.1931 (3), 1 female, 7.VI.1931 (3 & 5), 1 female, 13.VI.1931, 1 female; Hubbs Butte, 22.V.1931, 1 male, 6.VI.1931, 1 male; Jerome, 11.VIII.1930 (2), 1 male; Kimberly, 27.VI.1931, 2 females; Milner, 29.V.1930

(5), 1 male; Moscow, 6.VIII.1926, 1 male; Murtaugh, 29.V.1930 (3 & 5), 1 male; Oakley, 7.VIII.1929 (1, 3 & 5), 1 female; Rupert, 29.V.1930, 1 female; Tuttle, 22.V.1931 (4), 1 female; Twin Falls, 7.VI.1930, 1 male; Wendell, 22.V.1931 (5), 3 males. MONTANA: Big Butte, 8.VIII.195?, 1 male. OREGON: Corvallis, 15.VI.1981, 1 male, 26.VI.1985, 1 female, 3 males; Near Corvallis (St. Mary's Peak), 15.VIII.1984 (roadside vegetation), 1 female; Eugene, 6–12.VI.1984 (Malaise trap), 1 female, 11 males; McKinzie Pass (Mt. Washington Wilderness), 17.VIII.1984, 2 females, 20.VIII.1984, 5 females, 2 males; 1 mile w. McKinzie Pass, 1 female, 1 male. UTAH: Logan Canyon, 21.VII.1976, 1 female; Monte Cristo, 6.VII.1976, 1 male; Myton, 3 males; Wellsville, 13.V.1964, 1 male; 1.5 miles w. Wild Horse Butte (Wild Horse Creek), 31.VII.1982, 1 female. WASHINGTON: San Juan Island (Barney's Place), 23.VII.1944, 1 male. Vancouver, 15.VI.1911, 1 female, 1 male, 16.VI.1911, 1 male, 20.VI.1911, 1 female. WYOMING: Kemmerer, 12.VII.1985 (*Eriogonum*), 2 females, 13.VII.1985 [*Artemisia spinosa* (?=*spinescens* D.C. Eaton)], 1 male; Snowy Range, 23.VIII.1951, 2 females, 1 male.

Etymology.—The species name refers to the long petiole, characteristic of this species.

Biology.—The host(s) of *T. petiolatus* is unknown but it has been taken in association with a number of plants, such as *Artemisia* sp., *Descurainia sophia*, *Eriogonum*, *Salsola pestifer*, and *Sisymbrium altissimum* in Idaho and *Encelia* in California. It has also been collected in association with crop plants, such as beets in Idaho and barley in Alberta.

Thinodytes santerna Heydon, **new species**

Holotype, female.—Color: Body black with blue–green reflections on vertex, side lobes of mesoscutum, scutellum, gaster; coppery reflections on frenum and dorsellum; yellow–green reflections on middle lobe of scutellum and propodeum. Anten-

¹ The host plants for the specimens from Idaho are numbered as follows: 1= *A. rosae*. 2= *Beta vulgaris* L. 3= *Sophia sophia* (= *Descurainia sophia* (L.) P.B. Webb). 4= *Salsola pestifer* A. Nelson. 5= *N. (orta) altissimum* or *S. altissima* (= *Sisymbrium altissimum* L.).

na with scape yellow, flagellum brown dorsally, brownish white ventrally. Legs yellow beyond coxae, tarsi white, pretarsi brown. Fore wing veins pale brown.

Sculpture: Clypeus alveolate; frenum, dorsellum, propodeum smooth; gaster with T5-7 coriaceous, remainder smooth.

Structure: Body length 1.6 mm. Head width $1.4 \times$ height (28:20), $2.3 \times$ length (28:12); clypeus with three small symmetrically arranged clypeal denticles; weak genal concavity extending $\frac{1}{3}$ malar distance; eye height $1.3 \times$ length (11:10), $2.2 \times$ malar distance (11:6), length $5.0 \times$ temple length (10:2); ratio of MOD, OOL, POL, LOL as 2:3:6:3; vertex rounding regularly into occiput; antennal torulus just above LOCL. Antenna with length of pedicel plus flagellum $0.86 \times$ head width (24:28); ratio of lengths of scape, pedicel, anelli, F1-6, club as 10:3:1:2:2:2:2:2:6; widths of F1, F6, club as 2:2:2; club simple apically, with small patch of micropilosity ventrally on apical segment. Mesosoma arched dorsally, length $1.5 \times$ width (32:22); notauli shallow posteriorly; propodeum with basal fovea obscure, nucha lunate strip and carinate anteriorly, spiracles on anterior margin of propodeum. Fore wing with relative lengths of submarginal, marginal, postmarginal, stigmal veins as 24:12:12:6; stigma small; basal vein with row of setae along length. Petiole transverse, smooth. Gaster ovate acuminate, length $1.6 \times$ width (36:23); hind margin of T1 nearly straight, slightly convex mesally; hypopygium extending $\frac{1}{2}$ gastral length.

Discussion.—This species is distinct from all other *Thinodytes* species by the characters listed in the key: scape and legs beyond coxae pale, nonmetallic; frenum and median panels of propodeum smooth; plicae rounded and smoothly convergent posteriorly. In these characters, *T. santerna* is phenetically similar to species of *Notoglyptus*.

Type Material.—The holotype (USNM) was collected 3 April 1984, at the Eagle Borax Works in Death Valley National

Monument, Inyo County, California (USA) by E. E. Grissell on *Distichlis* in a brackish marsh.

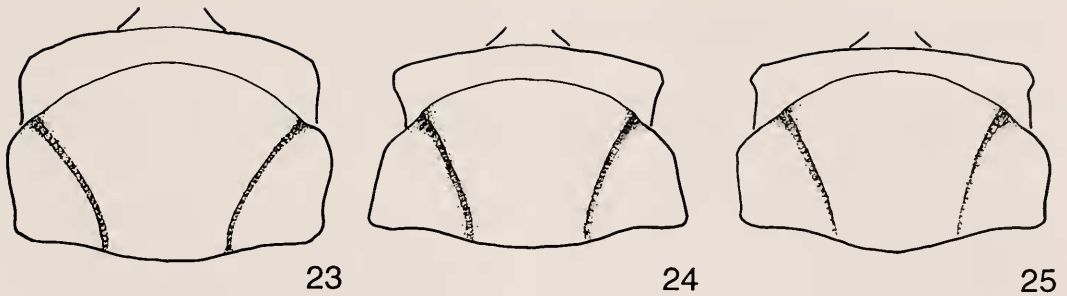
Etymology.—The specific epithet of this species is from the Latin noun *santerna*, meaning borax, and refers to the locality where the type specimen was collected.

Biology.—Nothing is known of the host(s) of *T. santerna*.

Mauleus Graham, 1981

Type Species: *Mauleus maderensis* Graham, 1981 (examined); original designation.

Description.—Body very dark green or blue; scape brownish yellow, nonmetallic. Head, pronotum, mesoscutum, scutellum (including frenum), dorsellum, median panels of propodeum, petiole alveolate; gastral tergites nearly smooth. Head with clypeus bidentate (left tooth compound) (Fig. 13), lateral part of mouth margin with short shallow genal concavity; antennal torulus $1 \times$ own diameter above LOCL. Antenna with scape cylindrical, $\geq 6 \times$ as long as wide; flagellum length less than head width in females, about equal to head width in males; funicular segments cylindrical; MPP sensilla in single row; female club simple apically and with small patch of micropilosity on apical segment. Male maxilla with palps slender, stipites unenlarged. Mesosoma (Figs 8, 21) arched dorsally; pronotum with collar short (Figs 23-25), nearly level with vertex dorsally, anterior edge rounded; mesoscutum with notauli shallow, impressed lines at most; scutellum as long as wide, lacking anterior median groove, frenum indistinguishable from remainder of scutellum; dorsellum short, length about equal to length of ridge across anterior margin of propodeum; propodeum (Fig. 20) with median panels short (width about $2 \times$ median length), plicae and median carina well developed and connected posteriorly by W-shaped carina; spiracles strongly ovate almost linear. Fore wing with relative lengths of veins as follows: submarginal >



Figs. 23–25. 23, *Mauleus maderensis* Graham, female pronotum and mesonotum; 24, *Mauleus iligneus* n. sp., female pronotum and mesonotum; 25, *Mauleus venetus* n. sp., female pronotum and mesonotum.

marginal > postmarginal > stigmal; stigma small, width about 2X width of stigmal vein; costal cell with complete row of setae and sometimes a partial second row; basal cell bare; basal vein setose; speculum present, open posteriorly. Petiole (Fig. 20) longer than wide, with basal flange thickened laterally, without median carina, without lateral setae. Gaster of females lanceolate, length 1.6 or more times width; hypopygium extending $\frac{2}{3}$ length of gaster or more; in both sexes, hind margin of T1 sinuous laterally, emarginate medially (Figs 8, 21).

Discussion.—This genus is placed in the *Halticoptera*-group as defined in this paper by: the rounded pronotum, shallow notauli, undifferentiated frenum, propodeum with a median carina and plicae connected by a W-shaped carina, reticulate petiole with a complete basal flange, and T1 that is sinuous laterally and emarginate medially. *Mauleus* and *Halticoptera* exhibit considerable phenetic similarity. The clypeus of *Mauleus* is secondarily bidentate (Fig. 13); the left hand clypeal denticle is divided by a sulcus formed as a result of the near fusion of the two approximated left hand denticles. These denticles are shown in their plesiomorphic separated state in *Thinodytes* (Fig. 11). The same compound condition of the left denticle is found in *Halticoptera* Spinola (Heydon, unpublished data). [In contrast, in

the unrelated genus *Sphiegaster* Spinola, the left tooth in the bidentate clypeus is a single unit (Heydon, unpublished data)]. The compound clypeal denticular structure and the nonmetallic scape are possible evidence of a close phylogenetic relationship between *Halticoptera* and *Mauleus*. *Halticoptera* is well-defined cladistically relative to *Mauleus* by the very low insertion of the antennae (at or below the LOCL) and by the male maxilla, which has the terminal two segments of the palps flattened, expanded, and nearly always yellow and often the stipites also expanded. Two apomorphic characters readily define *Mauleus* relative to *Halticoptera* and related genera: 1. The propodeum is shortened in *Mauleus* (median panels over 2X as wide as long in *Mauleus* species examined). 2. The basal flanges of the petiole are exceptionally large and thick, giving the petiole a connate appearance. The basal flanges in related genera are generally free-standing lamella and the petiole is more or less cylindrical.

Biology.—*Mauleus iligneus* has been reared from pupae of the native holly leaf miner, *Phytomyza ilicicola* Loew (Diptera: Agromyzidae). Like many other genera of the Miscogastrinae, it is likely that *Mauleus* species are parasitoids of the pupal stages of leaf-mining or stem-mining Diptera.

KEY TO DESCRIBED SPECIES OF *MAULEUS* GRAHAM

1. Pronotal collar with sides parallel in dorsal view (Fig. 23) 2
- Pronotal collar with sides widest near anterior margin and converging posteriorly in dorsal view (Figs 24, 25) 3
2. Vertex and mesoscutum with conspicuous pale setae. Propodeum with reticulations much less coarse than on scutellum, median panel each with broad shallow groove along anterior margin *nigritus* (Howard)
- Vertex and mesoscutum with indistinct dark setae. Propodeum with reticulations as coarse as on scutellum, median panel each with a pair of elongate sublateral depressions along anterior margin *maderensis* Graham
3. Propodeum with anterior depression between basal foveae; median panels with extensive area of weak, almost smooth sculpture. Pronotum with humeral angles acute, coming to blunt points in dorsal view (Fig. 25). MPP sensilla in two or more rows on funicular segments *venetus* Heydon
- Propodeum without distinct anterior depression between basal foveae; median panels almost entirely alveolate, with at most a small central patch of weak sculpturing. Pronotum with humeral angles either squared or slightly and smoothly convergent posteriorly (Fig. 24). MPP sensilla in single row on funicular segments (male of *M. cultratus* unknown) 4
4. Eye height 2.5–2.7× genal distance. Female with combined length of head and mesosoma longer than gaster; gaster less than twice as long as wide; hypopygium extending around $\frac{2}{3}$ gastral length (United States) *iligneus* Heydon
- Eye height 2.1–2.4× genal distance. Female with combined length of head and mesosoma less than or equal to length of gaster (Fig. 8); gaster more than twice as long as wide; hypopygium extending to near tip of gaster (southern México to Argentina) *cultratus* Heydon

Mauleus cultratus Heydon, **new species**

Fig. 8

Holotype, female.—Color: Head, pleural regions, propodeum dark blue; petiole bluish black; collar, dorsum of mesosoma greenish black; gaster dark brown, T1 with dark blue reflections. Antenna with scape brownish yellow with weak metallic reflections; pedicel, flagellum brown. Legs with coxae, trochanters, femora dark blue; tibiae brown except basal and apical tips brownish yellow; fore tarsi brown, middle and hind tarsi yellow–brown with pretarsi brown. Wing veins pale brown.

Sculpture: Clypeus, median portion of face finely alveolate; remainder of head, mesonotum, scutellum, frenum, median panels of propodeum alveolate; petiole finely alveolate; gaster smooth except T5–7 weakly coriaceous.

Structure: Body length (excluding ovipositor sheaths) 1.6 mm. Head width 1.2× height (26:21), 2.2× length (26:12); genal concavity extending $\frac{1}{3}$ malar distance; eye height 1.4× length (13.5:9.5), 2.2× malar distance (13.5:6.0), length 4.8× temple length; ratio of MOD, POL, OOL, LOL as 2:4:6:3; torulus 1X own diameter above LOcL. Antenna with length of pedicel plus flagellum 0.81× head width (21:26); ratio of lengths of scape, pedicel, anelli, F1–6, club as 9.0:3.5:1.0:1.5:2.0:2.0:2.0:2.0:5.0; widths of F1, F6, club as 2:3:3; MPP sparse, only one or two visible per segment from single view. Mesosoma length 1.4× width (33:23); pronotum with sides converging posteriorly; notauli incomplete; propodeum with width of median panels 2.2× length (11:5); basal fovea a shallow, triangular depression; plicae fading out in anterior $\frac{1}{2}$; spiracles 0.5× own diameter

from anterior margin of propodeum. Wing with relative lengths of submarginal, marginal, postmarginal, stigmal veins as 27:16:14:7; costal cell with single complete row of setae; basal vein setose with one seta posteriorly on cubital vein. Petiole length $1.5 \times$ width (9:6); sides narrowing posteriorly. Gaster lanceolate (Fig. 8), length $2.6 \times$ width (42:16), length $1.0 \times$ that of head and gaster (42:42); hypopygium reaching to apex of T7; ovipositor sheaths exerted for distance equal to half length of hind tibia.

Variation.—The color of the head, pleural regions, and petiole varies from dark blue, as in the holotype, to dark green and nearly concolorous with the dorsum of the mesosoma. The body length of specimens from the type locality is about 1.9 mm, whereas the length of the specimen from Ixtapan is 2.3 mm, the one from Morelia is 2.4 mm, and the female from Panamá is 3.1 mm in length. The ovipositor sheaths are exerted for a distance equal to $\frac{1}{3}$ to $\frac{1}{2}$ the length of the hind tibia.

Discussion.—*Mauleus cultratus* can be distinguished from *M. iligneus* by the characters given in the discussion section for that species.

Etymology.—The species name comes from the Latin word *cultratus*, meaning knife-shaped, and refers to the shape to the female gaster.

Type Material.—The holotype female (CNCI) and one paratype female were collected from San Cristóbal de las Casas, México, on 29 June 1969. Eight other paratype females were collected as follows (CASC, CDAE, CNCI, SEMC, USNM): Argentina. SALTA: Rosario de Lerma, 4-8.XI.1983 (Malaise trap). México. CHIAPAS: San Cristóbal de las Casas, 1-12.V.1969; MICHOACAN: Morelia, 6.IX.1938; MEXICO: Ixtapan, 9.VII.1954; TAMAUlipas: 6 miles n. Ciudad Victoria. Panamá. Chiriquí, XII.1946.

Biology.—The host(s) of this species are unknown.

Mauleus iligneus Heydon, new species

Figs. 13, 20, 21, 24

Holotype, female.—Color: Like that of *M. cultrata* except pedicel not metallic, and middle and hind tarsi white.

Sculpture. Clypeus and immediate vicinity finely alveolate (Fig. 13); remainder of head, mesoscutum, scutellum, frenum, median panels of propodeum alveolate; petiole finely alveolate; gaster smooth except T6 and T7 coriaceous.

Structure.—Body length 1.8 mm. Head width $1.3 \times$ height (29:23), $2.2 \times$ length (29:13); eye height $1.4 \times$ length (15.0:10.5), $2.5 \times$ malar distance (15:6), length $5.2 \times$ temple length (10.5:2.0); ratio of MOD, OOL, POL, LOL as 2.5:4.0:7.0:3.0; torulus located 1X own diameter above LOcL. Antenna with length of pedicel plus flagellum $0.88 \times$ head width (25.5:29.0); ratio of lengths of scape, pedicel, anelli, F1-6, club as 11.0:3.0:1.0:2.5:2.5:2.5:2.5:2.5:7.0; widths of F1, F6, club as 2.0:3.0:3.5. Mesosoma length $1.5 \times$ width (36.0:24.5); pronotum with humeral angles squared but sides convergent posteriorly (Fig. 24); notauli extending to hind margin of mesoscutum as impressed lines; propodeum (Fig. 20) with plicae fading out in anterior half, basal fovea extending halfway down median panels and bordered mesally by carina, nuchal area raised but acarinate anteriorly, spiracles almost on anterior margin of propodeum. Fore wing with relative lengths of submarginal, marginal, postmarginal, stigmal veins as 25:15:11:6; costal cell with one complete setal row and one partial row distally; basal vein with row of three setae. Petiole (Fig. 20) length $1.3 \times$ width (8:6); narrowing posteriorly; basal flanges large. Gaster fusiform (Fig. 21), length $0.87 \times$ length of head and mesosoma (39:45); length $1.8 \times$ width (39:22); hypopygium extending $\frac{2}{3}$ length of gaster; ovipositor sheath exerted for a distance equal to / length of hind tibia.

Allotype.—Male. Color similar to holotype except frons, callus green; flagellum

paler ventrally; tibiae brownish yellow. Body length 1.8 mm. Head with ocelli relatively larger, ratio of MOD, OOL, POL, LOL as 3.0:3.0:7.5:3.5. Antenna with lengths of pedicel plus flagellum $1.0 \times$ head width (31:31); relative lengths of scape, pedicel, annelli, F1–6, club as 10.0:3.5:1.0:3.0:3.5:3.0:3.0:3.0:3.0:8.0; widths of F1, F6, club as 2.5:3.0:3.0; setae reclinate. Gaster ovate, length $1.8 \times$ width (42:23) (Specimen critical-point dried so gaster in air-dried specimen will be shorter).

Variation.—Length of female specimens varies between 1.5 and 2.1 mm and males between 1.1 and 1.8 mm. Other than the rather large variation in size, this is a morphologically uniform species.

Discussion.—*Mauleus iligneus* differs from *M. cultratus* in the following: 1. The ratio of the eye height to the genal distance is more in *M. iligneus* [$\bar{x} = 2.56 \pm (\text{S.E.}) 0.022$ ($n = 12$); range 2.5–2.7] than in *M. cultratus* [$\bar{x} = 2.24 \pm 0.038$ ($n = 7$); range 2.1–2.4]. 2. *Mauleus iligneus* has a partial second row of setae in the costal cell of the fore wing, which is lacking from *M. cultratus*. 3. The ratio of the length of the head and mesosoma to the length of the gaster is relatively greater in *M. iligneus* [$\bar{x} = 1.23 \pm 0.03$ ($n = 10$); range 1.2–1.4] (Fig. 21) than in *M. cultratus* [$\bar{x} = 0.918 \pm 0.035$ ($n = 6$); range 0.8–1.0] (Fig. 8). 4. The ratio of the gastral length divided by its width is less for *M. iligneus* [$\bar{x} = 1.76 \pm 0.04$ ($n = 10$); range 1.7–1.9] than for *M. cultratus* [$\bar{x} = 2.56 \pm 0.11$ ($n = 6$); range 2.2–3.1]. 5. The hypopygium extends to about $\frac{2}{3}$ the length of the gaster in *M. iligneus* (Fig. 21), but is nearly even with the tip of T7 in *M. cultratus* (Fig. 8). 6. The ovipositor sheaths are exerted for a length equal to $\frac{1}{4}$ the length of the hind tibia in *M. iligneus* (Fig. 21), but for about $\frac{1}{2}$ the length of the hind tibia in *M. cultratus* (Fig. 8).

Etymology.—The specific epithet for *Mauleus iligneus* is an adjective based on the Latin word *ilex*, meaning holly.

Type Material.—The holotype (USNM),

allotype (USNM), and an additional nine female and seventeen male paratypes (UCDC, USNM) were reared from *Phytomyza ilicicola* on *Ilex opaca* Solander at Lexington, Kentucky by D. A. Potter collected 16 May 1984. An additional 43 paratypes were collected as follows (CNCI, UCDC): ILLINOIS: Cave-in-Rock State Park, near Cave-in-Rock, 4.VI.1981, 1 female. KANSAS: Oswego, 17.V.1976, 1 female. MARYLAND: College Park, V.1954 (ex holly leaf miner) 1 male, VII–VIII.1937 (ex *Phytomyza ilicis*), 4 females, 8 males; Laurel, 14.V.1965, 1 female. NEW JERSEY: New Brunswick, 26.V.1947 (ex *Phytomyza ilicicola*), 1 female. TEXAS: Houston, 8.XII.1929 (ex leaf miner on *Ilex vomitoria* Solander), 1 female, 1 male; Sanderson, 9.V.1912, 1 female. VIRGINIA: Norfolk, V.1929 (ex *Phytomyza ilicis*), 2 females, 6 males; Richmond, V.1938 (ex *P. ilicis*), 10 females, 4 males.

Biology.—This species has been reared numerous times from the complex of *Phytomyza* mining the leaves of holly [Potter and Gordon 1985 (as *Sphегigaster* sp.), Underhill 1943 (as *Sphегigastriinae*, new genus, new species), and Langford and Cory 1936 (as *Sphегigaster* sp.)]. It may also be the species called *Halticoptera* sp. by Kulp (1968), but voucher specimens from Kulp have not been seen. Host records prior to 1968 are questionable because the *Phytomyza* complex on holly was not studied in detail until then (Kulp 1968).

Potter and Gordon (1985) reported that *Mauleus iligneus* was a primary parasite when its agromyzid host, the native holly leafminer, *Phytomyza ilicicola*, was unparasitized, but was a facultative hyperparasite on *Opius striativentris* Gahan (Hymenoptera: Braconidae) when that species had already parasitized the agromyzid maggot. Potter and Gordon reared no *Mauleus iligneus* from puparia collected just a few days prior to the emergence of *Phytomyza ilicicola* and speculate that *Mauleus iligneus* parasitizes the fly late in its pupal stage.

Mauleus maderensis Graham

Fig. 23

Mauleus maderensis Graham, 1981:8.

Holotype, female (BMNH) Hym. Type No. 5.3454 (examined). Bouček and Rasplus, 1991:41.

Diagnosis.—*Mauleus maderensis* differs from the three newly described species in that it has the sides of the pronotum in dorsal view as for most other Pteromalidae—more or less parallel, but weakly convex, with the broadest point being about halfway between its anterior and posterior edge (Fig. 23). The three new species of *Mauleus* described in this paper have the pronotum in dorsal view broadest near its anterior margin and distinctly convergent posteriorly. *Mauleus maderensis* is similar in propodeal structure to the Caribbean species *M. niritus*. However, these two species are easily distinguished by the characters given in the key.

Distribution.—Madeira (Pico das Arrudas, near São Martinho), and possibly Mexico (Bouček and Rasplus, 1991) because the species is associated with plants of Mexican origin (Bouček, pers. comm.).

Biology.—The insect host(s) of *M. maderensis* remain unknown.

Mauleus nigrinus (Howard),
new combination

Polycystus nigrinus Howard, 1897:142. Holotype, female (BMNH); Hym. Type No. 5.876 (examined). Heydon, 1989:193.

Diagnosis.—The type of *Mauleus nigrinus* is fragmented with most of the antennae gone and the gaster and petiole mounted on the card separately from the remainder of the body. Enough is remaining however, to confirm that this species belongs in *Mauleus*. *Mauleus nigrinus* differs from the three newly described species in that it has the sides of the pronotum in dorsal view more or less parallel, with the broadest point being about halfway between its anterior and posterior edge. The three new species of *Mauleus* described in this paper

have the pronotum in dorsal view broadest near its anterior margin and distinctly convergent posteriorly. *Mauleus nigrinus* is similar in pronotal structure to *M. maderensis*; however, these two species are easily distinguished by the characters given in the key.

Distribution.—*Mauleus nigrinus* is known to me only from the holotype collected at Baltazar, on the windward side of Grenada (West Indies) by H. H. Smith.

Biology.—The insect hosts of *M. nigrinus* remain unknown.

Mauleus venetus Heydon, new species

Fig. 25

Holotype, female.—Color: Body black except anterior aspect of head, collar, mesoscutum steel blue and lateral portions of metanotum, propodeum, T1 blue. Antenna with scape, ventral side of pedicel and F1 brownish yellow, remainder of pedicel and flagellum brown. Legs with coxae dark blue; femora brown with metallic blue reflections, except basal and apical tips brownish yellow; tibiae brownish yellow with weak brown bands mesally; tarsi white with pretarsi brown. Fore wing clear with veins brownish yellow, parastigma darker.

Sculpture.—Clypeus and immediate vicinity finely alveolate; remainder of head, mesoscutum, scutellum, frenum, median panels of propodeum alveolate; petiole finely alveolate; gaster smooth except T6 and T7 coriaceous.

Structure.—Body length 2.2 mm. Head width $1.4 \times$ height (42:30), $2.5 \times$ length (42.0:16.5); eye height $1.5 \times$ length (20:13), $2.0 \times$ malar distance (20:10), length $7.5 \times$ temple length (13:2); torulus $2 \times$ own diameter above LOC; ratio of MOD, OOL, POL, LOL as 3.0:6.5:9.0:4.0. Antenna with length of pedicel plus flagellum $0.90 \times$ head width (38:42); relative lengths of scape, pedicel, anelli, F1–6, club as 15.0:4.0:1.0:4.5:4.5:4.0:4.0:3.5:8.0; relative widths of F1, F6, club as 3.5:4.0:4.0; MPP sensilla in two rows on each flagellar seg-

ment; terminal club segment with small ventral patch of micropilosity. Mesosoma length $1.5 \times$ width (26.5:18.0); pronotum with humeral angles acute (Fig. 25); dorsellum short, anterior and posterior edges parallel; propodeum with region between basal foveae depressed (this depression shorter mesally than laterally and bounded posteriorly by weak carina), plicae fading out before reaching anterior margin of propodeum, nuchal region raised, margined anteriorly by carina, spiracles almost on anterior margin of propodeum. Fore wing with relative lengths of submarginal, marginal, postmarginal, stigmal veins as 37:23:15:8; costal cell with 1 complete and 1 distal partial row of setae; basal cell bare; basal vein with row of setae; speculum open posteriorly. Petiole length $1.1 \times$ width (9:8). Gaster length $1.4 \times$ width (43:31), $0.66 \times$ combined length of head and mesosoma (43:65); hypopygium extending about $\frac{1}{2}$ gastral length; ovipositor sheaths hardly extending beyond hind margin of T7.

Allotype, male.—Similar to female except: body length 1.8 mm. Head with ratio of MOD, OOL, POL, LOL as 3.5:4.0:7.0:3.0. Antenna with length of pedicel plus flagellum $1.1 \times$ head width (37:34); relative lengths of scape, pedicel, anelli, F1–6, club as 11.0:3.0:1.0:4.5:4.5:4.0:4.0:4.0:9.0; relative widths of F1, F6, club as 3.0:3.5:3.0; MPP sensilla numerous and distributed over funicular segments in many rows; setae reclinate, nearly absent. Gaster length $1.1 \times$ width (29:26).

Diagnosis.—*Mauleus venetus* is distinguished from the other two Nearctic *Mauleus* species by the acute humeral angles of the pronotum, the broad depression along the anterior margin of the propodeum, and the lack of sculpture over most of the median panels of the propodeum. *Mauleus venetus* most closely resembles *M. iligneus*—the coloration of the two species is almost identical except the propodeum is brighter blue in *M. venetus*. In addition, the MPP sensilla of *M. venetus* are ar-

ranged in two or more rows on each funicular segment in both sexes, whereas they are arranged in only one row in *M. iligneus*.

Etymology.—The species name comes from the Latin word *venetus*, meaning blue or sea-blue, and refers to the distinctive blue propodeum in this species.

Type Material.—The holotype (IRCW) is a female, collected in Grant Co. (T6N, R6W, S17), Wisconsin (USA), in a malaise trap exposed 7–14.VI.1976. The allotype (UCDC) was collected by the author on the South Farms of the University of Illinois, near Champaign, Illinois (USA) on 26.V.1985. Six paratypes were collected as follows (CNCI, IRCW, UCDC, USNM): Canada. QUEBEC: La Trappe, 12.VII.1942, 1 female. United States. ILLINOIS: University of Illinois South Farms, near Champaign, 26.V.1985, 1 male. MICHIGAN: Midland Co., 2.VII.1943, 1 male. VIRGINIA: Winchester, 16.VI.1964, 1 male. WISCONSIN: Grant, T6N, R6W, S17, 3–8.VI.1976 (gypsy moth Malaise trap), 1 female, 14–21.VI.1976 (gypsy moth Malaise trap), 1 female.

Biology.—The host(s) of *M. venetus* are unknown.

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